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ABSTRACT

This study described the effects of a course on cooperative learning (CL) for student teachers. The course was conducted at two teacher education colleges in The Netherlands. Data collection included observation of the desired CL teaching behaviors and elementary students' engagement rates during cooperative activities; surveys of preservice teachers' attitudes toward CL; surveys of elementary students' attitudes toward CL; and surveys of preservice teachers' reactions to the course on CL. Results found a significant treatment effect for four of the five basic elements considered essential for lesson activities to be cooperative: positive interdependence, face-to-face interaction, social skills, and group processing. The course had a positive effect on the engagement of elementary students taught by preservice teachers in the treatment condition. Most preservice teachers believed in CL to achieve both academic and social goals, and they showed a readiness to use CL methods in future lessons. Elementary students taught by treatment group preservice teachers also showed positive attitudes toward working in groups and rated the benefits of working in groups rather than working alone quite positively. (Contains 24 references.) (SM)

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Training Student Teachers in Cooperative Learning Methods

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Abstract

In this study, the implementation effects of a course on cooperative learning for student teachers are described. The course was conducted at two different teacher education colleges in The Netherlands. Based on pre- and post-course observations, a significant treatment effect was found for four of the five basic elements regarded as essential for a lesson activity to be cooperative: positive interdependence, face-to-face interaction, social skills and group processing. In addition, the course had a positive effect on the engagement rates of the pupils of student teachers in the treatment condition. The majority of the student teachers subscribed to cooperative learning to achieve both academic and social goals and also showed a readiness to use cooperative learning methods in their future lessons. The pupils taught by the treatment student teachers also showed positive attitudes towards working in groups and rated the benefits of working in groups relative to working alone quite positively.

Training Student Teachers in Cooperative Learning Methods

Cooperative Learning (CL) is the instructional use of small groups in which pupils work together to maximise their own and each other's learning (Johnson & Johnson, 1994; 1999). In CL classrooms, the pupils are expected to help, discuss and argue with each other; assess each other's current knowledge; and fill any gaps in each other's understanding. CL often replaces individual seatwork, study and individual practice but not direct instruction by the teacher. When properly organised, pupils in CL groups make sure that everyone in the group has mastered the concepts being taught (Slavin, 1995).

The application of CL methods has become increasingly widespread in education. According to Slavin (1999), CL is one of the greatest success stories in the history of educational innovation. Almost unknown in the mid-1970s, CL methods are now often seen as a standard part of educational practice. During the last 20 years, a variety of CL methods have been developed and disseminated in the United States, Canada, Israel and parts of Europe. Important frameworks for CL have been developed by Cohen (1994a), Johnson and Johnson (1994), Kagan (1994), Slavin (1995), and Sharan and Sharan (1992). Although the number of teachers using CL as their primary instructional method is unknown, the approach is now used at least occasionally in many classrooms and its use is likely to increase in the future. Slavin (1999) remarks that although the reported numbers of teachers using CL methods probably overstate the actual sustained use of CL, the numbers nevertheless indicate extensive awareness of the methods and positive attitudes towards it.

Notwithstanding the growing popularity of CL and the substantial body of research demonstrating the positive effects of CL, CL methods are not commonly used in Dutch schools where learning is largely considered an individualistic enterprise. This emphasis on individualistic learning goes hand in hand with a lack of teacher training in CL methods. Current teacher training methodologies do not promote CL (see Panitz, 1999; Woolford Hoy & Tschannen-Moran, 1999). Dutch teachers are not trained to facilitate learning in small groups and are therefore not familiar with what CL involves. CL skills must be modelled and practised during teacher education to prepare prospective teachers for the use of these skills in their future classrooms. For this purpose, the Department of Educational Sciences of the University of Nijmegen and the Christian Pedagogical Study Centre (CPS, Amersfoort) undertook the development of a staff development program for CL in primary schools. On the basis of this program, a pre-service course was developed to train prospective teachers and, in the present study, the effects of this course are examined.

Cooperative Learning and its Basic Elements

In numerous school-based experiments over the past two decades, the effectiveness of CL methods for the promotion of pupil learning and social relations relative to more traditional whole-class methods of teaching has been demonstrated. Working together to achieve a common goal tends to produce higher achievement and greater productivity than working alone. CL has also been shown to result in process gain (i.e., higher-level reasoning), greater transfer and more time-on-task than competitive or individualistic learning. With regard to interpersonal relationships and social competence, CL promotes greater interpersonal attraction, the development of caring and committed relationships, the establishment and maintenance of friendships and less absenteeism and dropping out which results in higher self-esteem and greater social competencies than competing with one's peers or working independently (Abrami et al., 1995; Cohen, 1994b; Johnson & Johnson, 1989; 1994; Panitz, 1999; Slavin, 1995).

In a comprehensive review of the effects of CL, Slavin (1995; 1996) observed that CL is most effective when the groups are recognised or rewarded on the basis of the individual learning of the members. Group goals and individual accountability stimulate students to help each other and encourage maximum effort. Studies of CL methods incorporating group goals and individual accountability show a much higher median effect size than studies of other methods. The median effect size across 52 studies including group goals and individual accountability was +.32 and only +.07 across 25 studies not including group goals and individual accountability.

Another characteristic of CL related to its effectiveness is the heterogeneity of the group members (Bennett & Dunne, 1992; Johnson & Johnson, 1994; Slavin, 1995). Research has shown effective CL groups to include high-, medium- and low-ability pupils working together. Low- and medium-ability pupils clearly benefit from working cooperatively with high-ability peers. There is also evidence that the high-ability pupils are better off academically when cooperating with medium- and low-ability peers as opposed to working alone. Working in heterogeneous groups may benefit low-ability pupils by allowing them to observe the strategies of high-ability pupils. Similarly, high-ability pupils may learn new strategies by teaching other pupils in the group.

Simply placing pupils in groups and telling them to work together does not in and of itself produce a cooperative effort. There are many ways in which such an unstructured group effort can go wrong. Seating pupils together can produce competition or still result in individualistic learning. According to Johnson and Johnson (1994), teachers must understand the nature of cooperation and the essential components of a well-structured cooperative lesson in order to effectively use CL. Teachers with real expertise in the use of CL include

five essential components in their instructional activities: (1) positive interdependence, (2) individual accountability, (3) face-to-face promotive interaction, (4) social skills and (5) group processing (Johnson & Johnson, 1994; 1999).

Positive interdependence means that pupils see themselves as linked to the others in the group in such a manner that they cannot succeed unless their groupmates succeed. The pupils must really believe that they sink or swim together. Positive interdependence promotes a situation in which pupils work together in small groups to maximize the learning of all members, share their resources, provide mutual support and celebrate their joint success. Positive interdependence lies at the heart of CL. Once teachers establish positive interdependence, they must see that the pupils actually interact to help each other. Pupils are expected to discuss what they are learning, how to solve the assigned problems or complete the assignments and provide each other with help, assistance, support and encouragement.

Individual accountability exists when the performance of each individual pupil is assessed and the results are subsequently reported to both the individual and the group. It is important that the group members know that they cannot "hitch-hike" on the work of others.

To obtain meaningful *face-to-face interaction*, the size of the groups must be small (two to four members). In addition to this, however, CL requires particular *interpersonal and small-group skills*. The pupils must often be taught the social skills for high quality collaboration and be motivated to use these skills. *Group processing* exists when the members of the group discuss their progress towards the achievement of their goals and the maintenance of effective working relations. Some of the keys to successful group processing are allowing sufficient time for it to occur and making the processing specific rather than vague (Johnson & Johnson, 1994).

When the pupils work in small groups, the teacher's role is to monitor their interactions and intervene when necessary to help the pupils learn and interact more skilfully (Johnson & Johnson, 1994). Teachers observe the interactions of group members to assess their academic progress and their use of the appropriate social skills. By carefully listening to pupils' explanations of what they are learning to each other, teachers can determine what the pupils do and do not understand.

Despite the positive regard for CL, concerns have also been expressed about the successful use of the basic components in real classroom practice. In a recent study by Antil, Jenkins, Wayne and Vadasy (1998), only one of 21 elementary teachers in six elementary schools in two districts in the USA was found to apply Johnson and Johnson's five-element standard for CL. While research on the achievement effects of CL emphasizes the importance of using group goals and individual accountability (e.g., Slavin, 1995, 1996), only 24% of the teachers in the study by Antil et al. (1998) who said they used CL on a daily basis reported using forms of individual accountability linked to group goals. A study by Sparapani et al.

(1997) also shows that teachers' use of CL is not always consistent with what the scholarly literature recommends. In this study of 11 teachers from five states in the USA, middle grade teachers (grades 5-9) were rarely found to use group goals, apply individual forms of accountability or teach the pupils the social interaction and communication/problem solving skills necessary for working cooperatively. The findings from these two studies conducted in the USA are also in line with the outcomes of a recent Dutch study (Veenman, Kenter, & Post, 2000). The teachers from five different primary schools using CL methods were not found to adequately implement the elements regarded by Johnson and Johnson (1994; 1999) as essential for cooperation. In particular, the basic elements of positive interdependence, individual accountability, interpersonal and small group skills, and group processing received little attention from the teachers.

One important reason for the inconsistent implementation of the CL features promoted in the literature is an imperfect understanding of what CL really is. The study by Sparapani et al. (1997) showed teachers to learn about CL incidentally rather than intentionally. Studies concerned with how teachers actually use CL in the classroom also suggest that attention needs to be paid to training the essential features of CL (e.g., Antil et al, 1998; Johnson & Johnson, 1999). For teachers to acquire CL strategies, they must first be incorporated into teacher education programs and demonstrated. Hillkirk (1991) contends that CL should be placed at the core of the teacher education curriculum for three major reasons: (1) research shows convincing evidence of the positive effects of CL on academic achievement and social skills development; (2) CL experiences have been shown to be effective and motivating for student teachers; and (3) CL appears to enhance the interpersonal skills which can "make or break" school restructuring efforts. The present study addresses the question of whether student teachers following a course on CL are subsequently able to implement the CL methods into their classes during their practical training.

Research Questions

The specific research questions guiding this study were as follows. (1) Do student teachers implement the desired CL teaching behaviours as presented in the course? (2) Does the course on CL appear to affect the pupil engagement rates in classes with student teachers who participated in the course (3) Do student teachers show a more positive attitude towards CL after following the course on CL? (4) How do the pupils of student teachers who participated in the course on CL perceive working in cooperative learning groups? (5) Do the student teachers appear to value the new course on CL?

Method and Instrumentation

Design

The training in CL methods was conducted at two different teacher education colleges: College A located in the south of The Netherlands; college B located in the east. At each location, four sub-studies were undertaken: (1) an observational study of the implementation of the desired CL teaching behaviours and pupil engagement rates during cooperative activities; (2) a questionnaire study of the student teachers' attitudes towards CL; (3) a questionnaire study of the pupils' attitudes towards CL; and (4) a questionnaire study of the reactions of the student teachers to the course on CL.

The observational study and the questionnaire study of the student teachers' attitudes towards CL followed a one-group pre-test-post-test design at college A. At B, an untreated control group design with pre-test and post-test was used. The questionnaire studies concerned with the pupil's attitudes towards CL and the reactions of the student teachers to the course on CL were set up as one-group post-test-only designs at the two colleges.

Subjects involved at College A

The first sample for college A included 42 third-year student teachers from two parallel classes. All of the student teachers from these two classes followed the course on CL and thus constituted the treatment group. The possibility of a control group was discussed with the college administration but not realized because the administration decided that all student teachers should follow the course during their third year: all of the teacher educators from this college had followed a CL training the year before and judged a course on CL as both important and worthwhile for their students. In other words, the course on CL was mandatory at college A. All of the student teachers from college A were teaching one of the upper primary school grades (grades 3 - 6).

Due to time constraints and the number of observers available, 20 student teachers were randomly selected for observational study. At post-test, one student teacher could not be observed due to changes in the timetable of the primary school. The observed treatment group at college A thus consisted of 19 student teachers (and the pupils associated with each student teacher). There were 17 female and 2 male student teachers, and the ages of the student teachers varied from 19 to 25 years ($M = 21.2$; $SD = 1.6$). The average number of pupils in the classes taught by these student teachers was 23.8 ($SD = 5.2$).

The second sample for college A included 38 of the student teachers from the two treatment classes. Of the 42 questionnaires distributed to gain insight into the student

teachers' attitudes towards CL, 38 were actually returned during pre-test and post-test (response rate of 90%).

The third sample for college A included the 908 pupils from the 39 primary school classes being taught by student teachers (429 girls and 479 boys; grades 3 to 6). The questionnaires used to obtain the attitudes and reactions of the pupils regarding CL were given to all of the student teachers in the treatment group with the request to distribute the questionnaires to their pupils (response rate of 93%).

The fourth sample for college A included the 41 student teachers who returned the questionnaire used to obtain information on the student teachers' opinions with regard to the content of the course and their experiences with the implementation of CL in their classrooms. The questionnaires were distributed to the 42 student teachers who participated in the course on CL with 41 returning the questionnaire (response rate of 98%).

Subjects involved at College B

The first sample for college B included 16 second-year student teachers. At this teacher education college, the course on CL was an elective course. At the beginning of the academic year, 21 student teachers showed an interest in the course on CL. When the date of the first workshop was announced, only 12 student teachers from three different classes attended; the other nine student teachers had opted for another elective course. At post-test, one student teacher could not be observed because of changes in the timetable of the primary school. The observed treatment group for college B thus consisted of 11 student teachers (and their pupils). Fifteen of the second-year student teachers, not following the course on CL and randomly selected by the management team of the teacher training college, received a letter with the request to participate in the study as control students. Seven of these students agreed to participate; the others were not able to participate due to time constraints. At post-test, one student teacher could not be observed because of changes in the timetable. The control group at college B thus consisted of 6 student teachers (and their pupils). The student teachers from college B were teaching one of the primary school grades (grades 1 to 6).

Of the entire group of student teachers observed, 13 were women and 4 were men. The ages of these student teachers varied from 18 to 25 years ($M = 20.0$; $SD = 1.9$). The average number of pupils in the classes taught by these student teachers was 23.7 ($SD = 4.9$).

The second sample for college B included 16 student teachers: 10 in the treatment group and 6 in the control group. Of the 18 questionnaires distributed to gain insight into the student teachers' attitudes towards CL, 16 were returned at both pre-test and post-test (response rate of 89%).

The third sample for college B included 155 pupils from 7 primary school classes (74

girls and 81 boys; grades 1 to 6). The questionnaires used to gain insight into the attitudes and reactions of the pupils to CL were distributed to all of the trained student teachers with the request that they administer the questionnaires to their pupils (response rate of 58%).

The fourth sample for college B included 10 student teachers who returned the questionnaire pertaining to their opinions on the content of the CL course and their experiences with implementing CL in their classrooms. Of the 12 trained student teachers, 10 returned the questionnaire (response rate of 83%).

Cooperative Learning Observational Schedule

During each classroom observation, the observer took notes on what happened in the cooperative lesson conducted by the student teacher. Directly after each observed lesson, the observer used these notes and the Cooperative Learning Observational Schedule for Student Teachers to rate how the student teacher structured the cooperative lesson. This schedule contained 23 items pertaining to the instructional behaviours of the student teachers: 14 of the items were rated along a three-point scale (ranging from a score of 1 for no application of the instructional behaviour to a score of 3 for clear application of the instructional behaviour); 5 of the items had a list of alternatives from which the observer should select the most applicable answer; and 4 of the items required a yes/no response to indicate whether the instructional behaviour was applied or not. The construction of these items was mainly based on the research of Johnson and Johnson (1994), Slavin (1995) and Kagan's (1994) work on cooperative learning activities.

Prior to the collection of the observational data, the four observers went through a training program of about 50 hours. Two observers were responsible for observing the student teachers for college A and two observers were responsible for observing the student teachers for college B. The training program involved the coding of cooperative lesson videotapes as well as the live coding of cooperative lessons at two primary schools not involved in the study. The interobserver agreement for the observers at college A was based on 10 lessons; the interobserver agreement for the observers at college B was based on 12 lessons. During the training, four of the lessons were independently coded by all four observers to guarantee uniform coding of the instructional behaviours of the student teachers at both colleges. The interobserver agreement for the items from the observation schedule was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Interrater agreements below 75% called for a redefinition of the particular code and the retraining of raters. The mean interrater agreement across the items was 83%.

Pupil Engagement Rates

Every five minutes during the cooperative lesson being taught by the student teacher, the observer stopped taking notes and recorded the number of pupils engaged in academic activities (on-task). An on-task score for the entire class was then obtained by dividing the number of pupils engaged in the task by the total number of pupils present and multiplying by 100 which yields the percentage pupils classified on-task. The interobserver reliability for the on-task checks during the observational training program was estimated using analysis of variance (intraclass correlation; cf. Winer, 1971). For the two observers at college A, the reliability procedure revealed a coefficient of .87; for the two observers at college B, a coefficient of .76 was found.

Student Teacher Questionnaire

A Student Teacher Perceptions of Cooperative Learning Scale was developed to gather information on the student teachers' attitudes towards CL, the positive and negative aspects of CL, the role of the teacher in CL activities, and the student teachers' willingness to use CL in the near future. The scale contains 73 items to be rated between 1 (*strongly disagree*) and 5 (*strongly agree*). The scale is based on the work of Johnson and Johnson (1994), Slavin (1995), Lamberigts (1988), Panitz (1999) and the teacher CL questionnaire used in a study by Veenman, Kenter and Post (2000).

The content of the scale and the wording of the items were evaluated in discussions with four student teachers not involved in this study. The feedback received in these discussions resulted in a number of revisions which were made before the final version of the scale was produced.

On conceptual grounds, the 73 items constituting the scale can be divided into four subscales: (1) willingness to use CL in the near future; (2) CL benefits for pupils; (3) positive attitudes towards CL; and (4) positive attitudes towards work group management. Measures of internal consistency (Cronbach's alpha) were computed for the entire scale and for each subscale. These measures were based on the ratings of the student teachers from both colleges A and B. The alpha coefficients for the entire scale and the subscales were found to range from .71 to .98. Scores were then computed for the entire scale and the four subscales. Three items were dropped as a result of minimal response variance or a low item-total correlation. The final version of the scale thus contained 70 items.

Pupil Questionnaire

The Pupil Perception of Cooperative Learning Scale for pupils in grades 1 to 6 was developed to gather information on pupils' preferences for learning in groups and the potentially positive or negative outcomes of working in cooperative groups. This short scale contains 22 items and is based on a questionnaire used in the studies by Ros (1994) and Veenman, Kenter and Post (2000). For administration to the lower primary school grades, each question was first read aloud to the entire class; thereafter, the pupils were asked to provide their answers along a three-point Likert-scale with the items ranging from 1 (*not so nice* or *never*) to 3 (*very nice* or *always*).

To check the wording of the scale items, 23 of the grade 4 to 6 pupils not involved in the study were asked for feedback. The feedback provided by this pilot study resulted in minor revisions prior to the printing of the final version.

Based on the results of a principle components analysis, two factors or subscales could be formed: (1) positive experiences with working in groups and (2) benefits of working in groups versus working alone. These two factors accounted for 30% of the rating variance. The Cronbach alpha for the entire scale and subscales ranged from .75 to .81. The principal components analysis was based on the ratings provided by the pupils being taught by the student teachers from both colleges (n = 1063). One item was deleted from the list because of its low factor loading. The final version of the scale thus contained 21 items.

Course Evaluation Questionnaire

This questionnaire was developed to assess the student teachers' reactions to and evaluations of the course on CL. The questionnaire contains 37 items. Student teachers indicated along a five-point Likert scale how they valued the content of the course, the training manual, the workshops, the assignments for the conduct of cooperative activities during their practical teaching and the reactions of the cooperating teachers and pupils to the cooperative lessons.

The Course on CL

The course is based on two approaches prominent in the literature, namely Johnson and Johnson's (1994) "Learning Together" approach and Kagan's (1994) "Structural Approach." Johnson and Johnson's five-element standard was used to classify group work as CL. According to these authors, CL must include at least the conditions to promote positive interdependence (the perception of group members that they must work together to accomplish a goal), individual accountability (group members are held responsible for their

contribution to goal achievement), face-to-face interaction (group members meet face-to-face to promote one another's work), the development of small-group skills (the interpersonal skills needed to work in a group) and group processing (group reflection on the collaborative effort and decisions on how to improve effectiveness). During the CL course, the student teachers work together in cooperative groups using the different cooperative learning structures described by Kagan (1994). A cooperative learning structure is a content-free way of organising social interactions in the classroom. The CL structures usually involve a number of steps with proscribed behaviours for each step. After explaining the rationale behind a structure and explaining the steps involved in its execution, the student teachers work in heterogeneous cooperative learning groups and apply the relevant structure to directly experience its practical value. This method of learning-by-doing is called the "immersion approach" by Nattiv, Winitzky and Drickey (1991): CL is introduced during the first workshop and used as the only instructional strategy thereafter. The course includes 15 cooperative learning structures; examples are Numbered Heads Together, Three Step Interview, Round Robin and Round Table, Think-Pair-Share, Team Word Web, Pairs Check and Jigsaw (Kagan, 1994).

The course consists of eight workshops. The duration of each workshop varied from 90 to 120 minutes. During the first workshop, the student teachers' prior knowledge of CL is activated by constructing a Team Word Web and both sharing and discussing these word webs. The student teachers are then prepared for group work by participating in a team-building activity called "the Gordian knot." This activity is used to identify the five essential components of CL distinguished by Johnson and Johnson (1994), and each of the five elements is then elaborated in one of the next workshops.

During the second workshop, the student teachers are asked to develop their own vision of CL, share their individual and team visions and then construct a common class vision. The central theme of this workshop is the promotion of face-to-face interaction between pupils while working in cooperative groups in primary school. Attention is paid to such topics as structuring the pupil's learning goals competitively, individualistically and cooperatively; differences between one-way and two-way communication; assigning pupils to groups; heterogeneous versus homogeneous grouping; and the physical arrangement of the classroom.

The third workshop is devoted to the development of interpersonal and small-group skills as a prerequisite for effective group work. The activities in this workshop include assessment of the cooperative skills of the pupils in the classes being taught by the student-teachers, definition of the steps needed to teach cooperative skills, the encouragement of participation using T-charts (charts describing two questions: "what would this skill look like?" and "what would this skill sound like?"; see Johnson & Johnson, 1994) and the design

of T-charts for one's own classroom.

Promotion of positive interdependence is the topic of the fourth workshop. Attention is paid to six forms of positive interdependence: (1) goal interdependence (group members recognize that they can only achieve their learning goals when all members of the group attain their goals); (2) reward interdependence (each member of the group receives the same reward when the group achieves its goals, sometimes supplemented by bonus points); (3) outside force interdependence (placing groups in competition with each other); (4) resource interdependence (each member of the group has only part of the resources, information or materials necessary to complete the given task); (5) role interdependence (each member is assigned one of the complementary but interconnected roles needed to complete the joint task, such as recorder, checker of understanding, encourager of participation, reader); and (6) task interdependence (a division of the learning task so that each member of the group is responsible for completion of part of the task). In this workshop, task interdependence is used to divide a text about positive interdependence into smaller parts which are then assigned to different cooperative groups for study and discussion using the Jigsaw as the cooperative structure.

The fifth and sixth workshops are devoted to the topics of individual accountability/personal responsibility and group processing. Some of the common ways to structure individual accountability are examined, such as taking random individual turns or oral examinations, giving an individual test to each student or assigning specific roles to group members (e.g., one pupil in each group serves as the checker who asks others to explain the reasoning and rationale behind the group answers). Attention is also paid to the creation of role-charts for group members (e.g., specification of the skills needed for the roles of helper, reader, checker, etc.) and to the establishment of strategies for encouraging the correct execution of the roles. The questions addressed for evaluating cooperative small group work are: why, what, how, and when to evaluate and by whom? Two levels of assessments are discussed: academic task (evaluating the quality and quantity of pupil's learning) and social skills (evaluating how well the group functioned). Different observation procedures and structured observation forms are also considered. A lesson planning guide is provided to assist the student teachers in their preparation of cooperative lessons.

In the seventh workshop, the final assignments for the cooperative lessons during the practical teaching period were provided and discussed. The 15 cooperative structures included in the course are reviewed and considered in connection with the design of the cooperative learning activities for the classroom.

In the eighth and final workshop, the experiences of the student teachers with the CL activities during the practical teaching period are shared and discussed. The student teachers are again asked to create Team Word Webs and to compare these webs with those created in

the first workshop in order to examine what they have learned about CL. The course is concluded with a short oral evaluation of the eight workshops.

Background information on the topics considered in the eight workshops is provided in a manual (80 pages) distributed to each student teacher prior to the first workshop. This manual also provides a description of the 15 cooperative structures. At each of the teacher education colleges, the course was conducted by two educational sciences students with experience in CL methods under the supervision of an experienced teacher educator. During the course, the student teachers at college A practised teaching at the primary schools three times for a full week; the student teachers at college B practised teaching one day a week. Following each workshop, the student teachers received an assignment requiring them to put that what they learned during the workshop into practise (e.g., after the fourth workshop the student teachers are asked to select and use a cooperative structure for the promotion of positive interdependence). During each workshop, time is also set aside to discuss the student teacher's experiences with the implementation of CL in the classroom.

In designing the workshop activities, the training process was guided by the recommendations of Joyce and Showers (1995) for effective training: (1) presentation of theory, (2) modelling or demonstration, (3) practice, (4) structured feedback and (5) coaching. The theory is presented in the training manual. Modelling or demonstration of the suggested cooperative teaching skills is done by the trainers, by using video fragments modelling the cooperative structures and case studies in the manual. Practice is achieved by practising with peers (role playing) and by the asking student teachers to try out the cooperative activities in their classrooms and to discuss their experiences at the next workshop. Feedback is provided by the cooperating teachers. Unfortunately, coaching by peers could not be realised because the student teachers did not always come from the same school and could not find the time to observe each other's lessons.

Data Collection

The course on CL was conducted in the final semester of the teacher education program. Prior to the start of the course, each student teacher was observed during one lesson. After completion of the course, each student teacher was again observed for one lesson (same school, same grade). In order to control for the possible influence of lesson content, some guidelines concerning lesson format were provided. The student teachers were asked to present new learning material and to create opportunities for small group work to master the concepts being taught. The observed lessons lasted about thirty minutes.

The Student Teacher Perception of Cooperative Learning Scale was also administered prior to and after completion of the course. During workshop seven, the Pupil Perception of

Cooperative Learning Scale was distributed to the student teachers with the request to administer the scale in their classrooms. The Course Evaluation Questionnaire was administered during the last workshop.

The pupil engagement rates for each lesson were averaged to produce means for each class and each student teacher. For the observational data, the mean scores for the essential components of CL were computed by averaging the item values. For the student teacher and pupil questionnaire data, scale scores were computed by averaging the item values for the entire scale and for each of the subscales. For the data pertaining to course evaluation, the mean scores were computed for each item. In testing for differences between the pre- and post-test scores of the treatment student teachers (for college A) or differences between the treatment student teachers and the control student teachers (for college B), a level of significance of 5% was used (one-tailed). The unit of analysis was the student teacher (and his/her class of pupils); for pupil questionnaire data, the unit of analysis was the pupil.

Results

The SPSS one tailed *t*-test for paired samples was used to examine the differences between the pre- and post-test observational data for the treatment group of student teachers from college A. The results in Table 1 show the course on CL to have a significant effect ($p < .01$) on five of the six categories from the Cooperative Learning Observation Schedule, namely positive interdependence (combining items referring to goal, reward, resource, role, task and outside force interdependence), face-to-face interaction (combining items referring to room arrangement, facilitating eye-to-eye interaction and providing assignments requiring direct communication), social skills (one item referring to the rules for effective cooperation), group processing (items referring to the evaluation of academic and social skills) and monitoring workgroups (items referring to the monitoring of pupil behaviour and the provision of task assistance). No significant effect was found for the observational category pertaining to individual accountability (items referring to the assessment of each pupil working in the group and the division of tasks).

The course on CL appeared to have a significant effect on pupil's engagement rates. After the course, the treatment group pupils exhibited significant increases in their time-on-task levels: 84% before the course and 94% after the course ($p < .01$).

The data for the student teachers from college B are also displayed in Table 1. Comparison of the treatment and control groups prior to the course on CL revealed one significant difference. At pre-test, the control student teachers scored higher on the observational category pertaining to positive interdependence than the treatment student teachers ($p < .05$). Due to this initial difference, an analysis of covariance (ANCOVA) was

used to examine the differences between the treatment and control groups for college B (with the initial scores for the observational categories and pupil engagement rates as covariates).

When the pre- and post-test data for the treatment group were compared, significant differences were found for four of the six observational categories: positive interdependence, face-to-face interaction, social skills and group processing ($p < .01$). The treatment student teachers were found to use these basic elements of CL more effectively at post-test than at pre-test. No significant pre-test/post-test differences were found for the observational categories of individual accountability or monitoring of work groups. For the control student teachers from college B, no significant differences between pre- and post-test were found. When the adjusted mean scores for the treatment student teachers were compared to those for the control student teachers (see Table 1), significant differences were found for three of the observational categories: face-to-face interaction ($p < .05$), group processing ($p < .01$) and monitoring work groups ($p < .05$).

The results in Table 1 also show the course on CL to significantly affect pupil-engagement rates in college B ($p < .05$). After the course, the treatment group pupils exhibited significant increases in their time-on-task levels: 86% before the course and 93% after the course. In contrast, the control group pupils showed a decrease in their time-on-task levels: 92% at pre-test and 86% at post-test.

The classroom observations revealed the following information with regard to the cooperative activities implemented by the student teachers. Mathematics, reading, social studies and expressive subjects were the content areas where CL was used most frequently. When groups were formed for cooperative work, 90% of the groups at post-test were formed by the treatment student teachers rather than the cooperating teachers and 10% by the pupils themselves; for the control student teachers, 67% of the groups were formed by the student teachers and 33% by their cooperating teachers. Of the observed forms of grouping, most of the student teachers used heterogeneous grouping by social skills, followed by groups of convenience (e.g., pupils who sat near one another). In the observed cooperative lessons, T-charts were not used by either group of student teachers. At pre-test, Kagan's cooperative learning structures were not used. At post-test, the following structures were used by the treatment student teachers: Numbered Heads Together (32%), Round Robin and Round Table (26%), Think-Pair-Share (19%), Team Word Web (5%), Pairs Check (5%) and Jigsaw (5%). In contrast, the control student teachers did not apply any of Kagan's cooperative learning structures.

Table 2 contains the results for the Student Teacher Perception of Cooperative Learning Scale. The results for college A show those student teachers who participated in the course to score significantly higher at post-test on the subscale "positive attitudes towards workgroup management" after completion of the course ($p < .05$). No significant differences

were found for the scores of the treatment student teachers on the remaining three subscales and the total scale.

Table 2 also displays the perception of CL scores for the student teachers from teacher education college B. The results of the one-tailed *t*-tests used to examine the differences between the pre- and post-test data for the treatment group show those student teachers who participated in the course to score significantly higher on the subscale "CL benefits for pupils" ($p < .05$). For the control student teachers, no significant differences between the pre- and post-test scores were found. When comparing the treatment group with the control group prior to the course on CL, no significant differences were found for the total Student Teacher Perception of Cooperative Learning Scale or any of the subscales. For this reason, independent one tailed *t*-tests were used to compare the post-test scores for the treatment student teachers with those of the control student teachers. However, no significant differences in the post-test scores for the two groups were found. It should be noted that both the treatment and control student teachers scored above average on this scale even at pre-test. The same outcome was found for the student teachers at college A.

In Table 3, the results of the Pupil Perception of Cooperative Learning Scale are presented. The mean scores on the scale and the two subscales show that the pupils experienced working in groups during the lessons taught by the treatment student teachers quite positively. They also liked working in groups more than working alone. All of the scores were above average. No significant differences were found between boys and girls. One significant difference was found between the pupils in the lower grades (1, 2, 3) versus the pupils in the upper grades (4, 5, 6). The pupils in the upper grades scored significantly higher on the subscale "benefits of working in groups versus working alone" than the pupils in the lower grades ($t(1061) = 2.9, p < .01$).

The results of the Course Evaluation questionnaire indicate that the course manual was studied and used by the treatment student teachers (tables not included here). Those student teachers who returned the questionnaire reported that the course was very helpful because it provided many concrete, specific and practical suggestions. The workshops and trainers were also rated quite positively. The student teachers expressed their readiness to use cooperative activities in their future lessons, and they also reported that the reactions of their pupils and their cooperating teachers towards CL were very positive. The administrations from the teacher education colleges therefore decided to use the course on CL in the next year.

Discussion

The results of the present study suggest that a course on CL can have a positive effect on the

cooperative instructional skills of student teachers. Treatment student teachers were generally rated higher on observational categories reflecting CL activities. At both colleges A and B, the course on CL significantly affected four of the five basic elements regarded as essential for an activity to be judged cooperative (Johnson & Johnson, 1994; 1999). Significant pre- and post-test observation differences were found for the following four elements: positive interdependence, face-to-face interaction, social skills and group processing. In addition, a significant increase at college A was found for the monitoring of workgroups. When compared to the control student teachers, the treatment student teachers at college B gained significantly more in the areas of face-to-face interaction, group processing and monitoring workgroups. In sum, the introduction of student teachers to CL through direct experience with the instructional strategy appeared to help student teachers incorporate four of the five basic elements of CL into their lessons.

Contrary to our expectation, no significant increase was observed for the structuring of individual accountability within the cooperative lesson activities. Individual accountability is nevertheless one of the critical components of CL as it permits identification of each group member's contribution to the group's work. As already mentioned, research on the achievement effects of CL emphasizes the importance of group goals and individual accountability (Slavin, 1995; 1996). In the present study, the observed student teachers used mainly cooperative activities emphasising a common group product without identifying the contributions of individual group members. These activities thus had low individual accountability and, with respect to the manner in which student teachers can structure individual accountability into their CL activities, our course is in need of revision. Greater attention should be paid to such forms of structuring as (1) administering an individual test to each pupil; (2) randomly selecting individual pupils to represent the entire group, (3) having each pupil explain what they have learned to a classmate, (4) giving random oral examinations, or (5) assigning one pupil in each group to serve as checker.

With regard to student engagement rates, the course on CL had a significant positive effect. After completion of the course, the on-task scores of the pupils in the classes of the treatment student teachers increased. Keeping students highly involved appears to be an effect of having students work together in groups. This finding is in line with the research on CL and pupil time-on task (Johnson and Johnson, 1994).

The positive attitudes of the student teachers towards CL even at pre-test show student teachers to view CL as a worthwhile instructional strategy. Their above average ratings show their readiness to use CL in the future. The student teachers also believe that CL can clearly promote the cognitive and social skills of their pupils. Only two significant pre-test/ post-test differences were found: after completion of the course, the student teachers from college A showed more positive attitudes towards work group management and the student teachers

from college B perceived more CL benefits for pupils. It should be noted that the possibility of a ceiling effect on the attitudes of the student teachers towards CL cannot be excluded and that such an effect may thus explain why it was almost impossible to improve the pre-test scores.

The pupils being taught by the treatment student teachers also showed a positive attitude towards working in groups and rated the benefits of working in groups as opposed to working alone quite positively. These positive pupil perceptions also accord well with the positive outcomes of previous research (e.g., Johnson & Johnson, 1994; Kagan, 1994; Slavin, 1995; McManus & Gettinger, 1996; Veenman, Kenter, & Post, 2000).

The data from the Course Evaluation Questionnaire clearly show the student teachers to appreciate CL. They appreciate the opportunity for more direct interaction and cooperation with their fellow students and the opportunity to experience CL firsthand. They not only believed that CL can promote the learning of their future pupils but also their own learning.

The present study shows pre-service teachers to clearly value the chance to work together on cooperative skills and to experience CL as a worthwhile instructional approach for not only their own learning but also the learning of their future pupils. When implementing a course on CL in pre-service classes, it is important that CL methods become part of both the content and the process (Nattiv, Winitzky, & Dricky, 1991). CL has been found to be beneficial for not only the student teachers themselves but also for those who want to use CL in their classes in the future. Although the student teachers in this study recognised that the development of their skills in using CL had just begun, they appeared to be very motivated to further develop this newly acquired competence.

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Table 1

Means and standard deviations for the Cooperative Learning Observational Schedule and results of t-tests and ANCOVA

	College A			College B				
	Treatment Group (n = 19)		t	Treatment Group (n = 11)		Control Group (n = 6)		F
Observational categories	Pre-test	Post-test		Pre-test	Post-test	Pre-test	Post-test	
Positive interdependence	1.5	2	3.3**	1.3	1.8**	1.6	1.8	<1.0
Individual accountability	1.4	1.7	12	1.8	2.1	1.5	1.4	24
Face-to-face interaction	2.3	2.6	3.9**	2.2	2.6**	2.1	2.2	6.7*
Social skills	1.3	2.2	3.6**	1.1	1.9**	1.7	1.3	12
Group processing	1.7	2.3	2.9**	1.7	2.5**	1.7	1.5	11.5**
Monitoring work groups	2.3	2.7	3.4**	2.4	2.7	2.5	2.3	3.2*
Pupil engagement rates (in %)	84	94.2	4.7**	86.3	93.0**	92.3	86.4	6.0*

Note. Means are based on a three-point scale (with the exception of pupil engagement rates): 1 = no clear application of the CL characteristic; 3 = clear application of the CL characteristic. Standard deviations in parentheses. * $p < 0.05$; ** $p < 0.01$.

Table 2

Means and standard deviations for the Student Teacher Perceptions of Cooperative Learning Scale and results of t-tests

	College A			College B				
	Treatment Group (n = 38)		t	Treatment Group (n = 10)		Control Group (n = 6)		t
Scale/Subscales	Pre-test	Post-test		Pre-test	Post-test	Pre-test	Post-test	
STPCLS total (70 items, α = .98)	3.9	3.9	<1.0	3.8	4	3.9	4	<1.0
Willingsness to use CL (23 items, α = .88)	4	3.9	-15	3.8	4.1	4	4.1	<1.0
CL benefits for pupils (15 items, α = .85)	3.8	3.7	-13	3.6	4.0*	3.8	3.9	<1.0
Positive attitudes towards CL (9 items, α = .73)	3.8	3.7	-17	3.9	3.8	4	4	<1.0
Positive attitudes towards work group management (23 items, α = .71)	3.9	4	2.3*	3.9	4.1	3.7	3.8	16

Note. Means are based on a five-point scale: 1 = strongly disagree; 5 = strongly agree. Standard deviations in parentheses. * $p < 0.05$.

Table 3

Means and standard deviations for the Pupil Perceptions of Cooperative Learning Scale for treatment student teachers

	College A (n = 908)		College B (n = 155)		All Pupils (n = 1063)	
Scale/subscales	*M*	*SD*	*M*	*SD*	*M*	*SD*
PPCLS total (21 items, α = .81)	23	3	22	3	23	3
Positive experiences with working in groups (9 items, α = .75)	21	4	21	4	21	4
Benefits of working in groups versus working alone (12 items, α = .75)	24	3	23	4	24	3

Note. Means are based on a three-point scale: 1 = not so nice/never, 3 = very nice/always